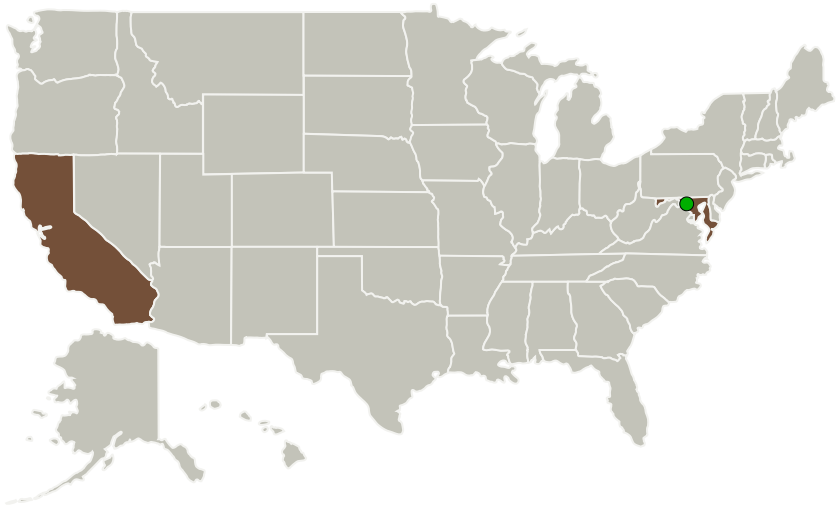
Geiger-Mode SiGe Receiver for Long-Range Optical Communications, Phase I

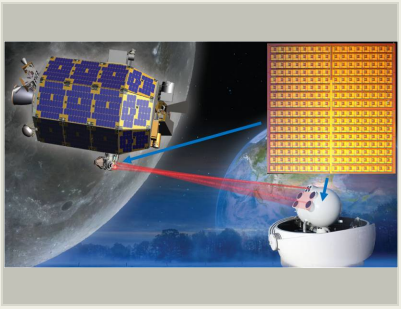
Completed Technology Project (2017 - 2017)

Project Introduction

The objective of this program is to develop, demonstrate and implement a photon-counting detector array sensitive in the wavelength range from 1000 nm to 1600 nm, with monolithically integrated time-tagging electronics, suitable for free-space optical communications, where high data volume returns from space missions are critical, such as in the Lunar Laser Communication Demonstration (LLCD) and other future NASA missions. Conventional photon counting detector arrays are implemented in either Silicon (Si) or Mecury Cadmium Telluride (HgCdTe), negating detection at wavelengths longer than about 1000 nm in the case of Si or incurring high cost and complexity for HgCdTe. In this program, Freedom Photonics will develop a novel Geiger-mode Silicon Germanium (SiGe) receiver for photon counting applications with increased sensitivity for wavelengths in the range of 1000 nm to 1600 nm, which utilizes standard BiCMOS process, resulting in a low-cost, high-sensitivity, high-speed and radiation hard receiver for long-range optical communications.

Primary U.S. Work Locations and Key Partners





Geiger-Mode SiGe Receiver for Long-Range Optical Communications, Phase I Briefing Chart Image

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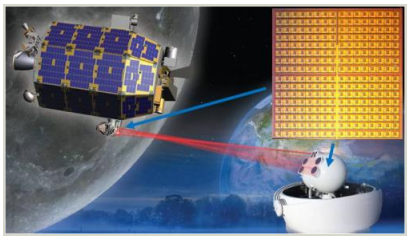
Organizations Performing Work	Role	Type	Location
Freedom Photonics, LLC	Lead Organization	Industry	Santa Barbara, California
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
California	Maryland

Images



Briefing Chart Image
Geiger-Mode SiGe Receiver for Long-Range Optical Communications, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/127819)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Freedom Photonics, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

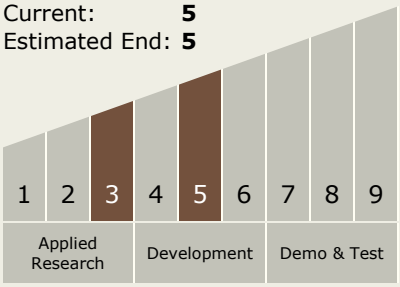
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Daniel Renner

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.1 Optical Communications
    - TX05.1.1 Detector Development